



Idaho State Department of Agriculture  
Division of Agricultural Resources

Water Quality Monitoring Report  
Succor Creek Wetland Development  
and  
Bank Stabilization Project



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ISDA Technical Result Summary No. W-5

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## Introduction

This project is being conducted by the Idaho State Department of Agriculture (ISDA) to provide technical support to the Owyhee Soil Conservation District on an EPA 319 project located near Homedale, Idaho. The 319 project consists of wetland design and development along with stream bank restoration along Succor Creek. ISDA technical support is in the form of in-kind services for water quality monitoring and analytical testing on Succor Creek. ISDA monitoring program is being conducted to evaluate the water quality of Succor Creek within the area of the proposed wetland and stream bank restoration project.

ISDA technical support is divided into two phases. Phase one consisted of pre-construction monitoring (background) on Succor Creek and Sage Creek, which has been completed (April 2000 through March 2001). Phase two will consist of post construction monitoring of the wetland to evaluate treatment efficiency. Phase two

will include continued monitoring on Succor Creek to determine water quality benefits derived from the wetland and stream bank restoration.

## Background

Succor Creek is located within Hydrological Unit Code (HUC) #17050103 and is listed for TMDL development in 2002. Succor Creek is a 303(d) listed segment from the Oregon border to its confluence with the Snake River (5.38 river miles). The pollutant of concern for this reach of Succor Creek is sediment.

Two sites were monitored on Succor Creek. The upstream site (SC-1) was located approximately 100 feet upstream of where Sage Creek (SG) enters Succor Creek. The downstream site (SC-2) was approximately 1000 feet downstream of where Sage Creek (SG) enters Succor Creek. The downstream site on Succor Creek was located approximately 1.3 miles upstream from

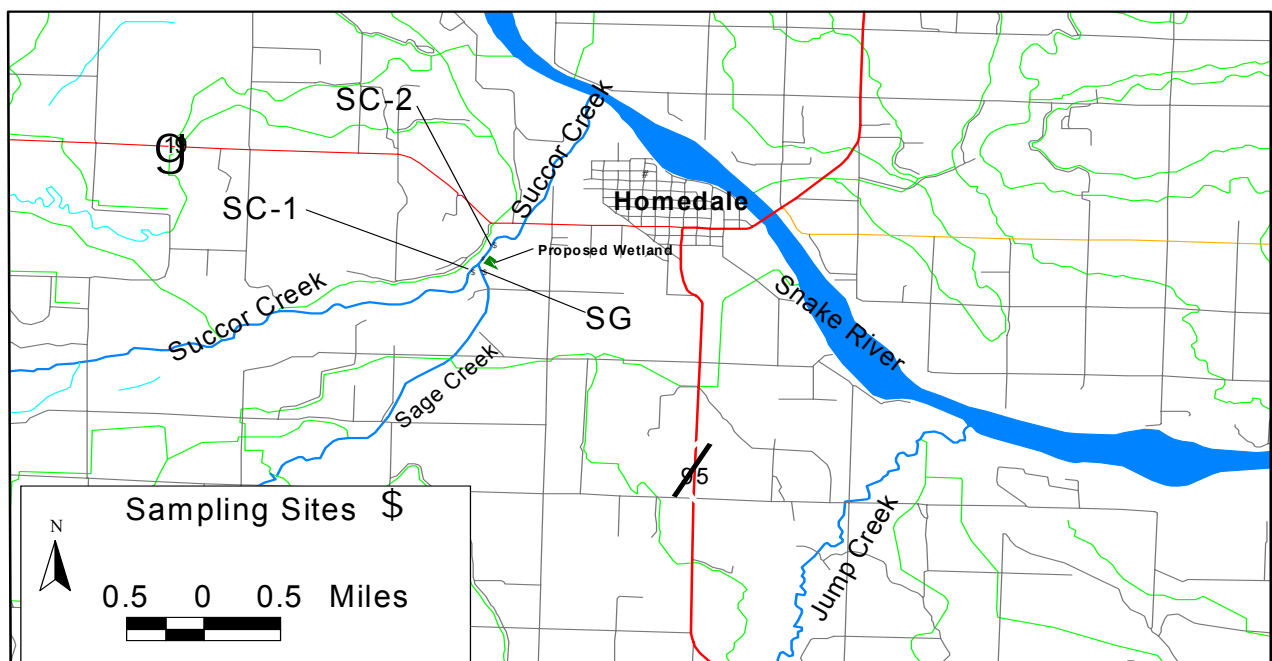


Figure 1. Succor Creek Site Map

where Succor Creek enters the Snake River. The third site was on Sage Creek (SG) approximately 100 feet upstream of its confluence with Succor Creek (Figure 1).

All three sites were monitored for one year with samples being collected twice a month from April 2000 through October 2000 and monthly from October 2000 through March 2001. Instantaneous on-site measurements were collected for discharge, dissolved oxygen (DO), percent saturation (% sat), temperature, conductivity, total dissolved solids, and pH. Analytical parameters consisted of nitrate/nitrite ( $\text{NO}_3\text{+NO}_2$ ), total phosphorus (TP), ortho-phosphorus (OP), total suspended solids (TSS), total volatile suspended solids (TVSS), fecal coliform, and *Escherichia coli* (*E.coli*).

During this program there was a large beaver dam constructed on Succor Creek just downstream of Sage Creek. This dam caused severe backwater conditions that caused ISDA to miss two sampling events (December 2000 and January 2001) at SC-1 and miss one (December 2000) on SG. The beaver dam caused severe backwater which effected the concentration of TSS and TP (due to settling) at all of the sites, especially site SC-2. In addition, no samples were collected on Succor Creek during a high water event on February 2001.

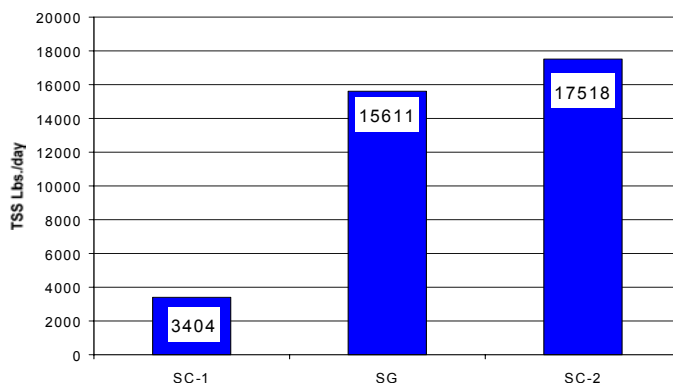
One other event worth noting occurred on May 3, 2000. On this date the water quality of Succor Creek was severely degraded due to a very heavy sediment load (Appendix A). High TSS values, especially at the upstream site, suggested some type of activity occurring within the creek channel upstream of our site. There had been no unusual meteorological events to explain the high sediment load that occurred prior to this sampling date. The TSS and TP data collected on this date were not used in calculating mean concentrations or loads (Appendix A).

## Results

### Total Suspended Solids (TSS)

Total suspended solids (TSS) levels for SG and SC-2 had a mean concentration of 119 mg/l and 68 mg/L respectively. As expected, the greatest TSS concentrations occurred during the irrigation season and during early spring runoff events. Sage Creek transports primarily irrigation return water during the summer months and accounts for the majority of the load recorded at SC-2 (Figure 2). During the fall and winter months SG discharge is comprised primarily of shallow ground water recharge. SC-1 had one high TSS value (101 mg/L) that occurred on March 19, 2001. The remaining TSS meas-

urements never exceeded 50 mg/L and the upstream site had an overall yearly mean concentration of 25 mg/L. The sediment load at the downstream site was somewhat lower than Succor Creek Upstream and Sage Creek combined (Figure 2). The lower station on Succor Creek was below a major bend in the creek and there were large deadfalls within the creek. These factors had a tendency to slow the creek velocity and allow the settling of solids.

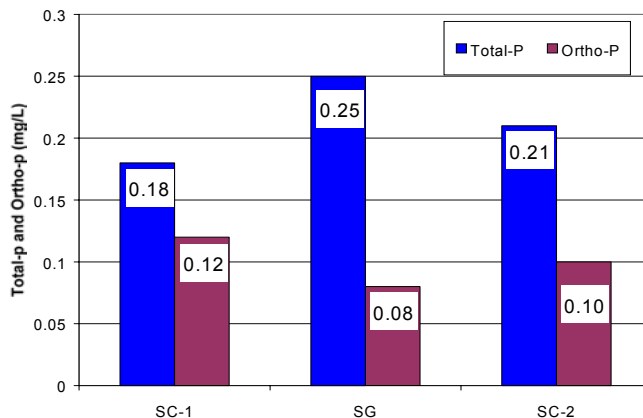


**Figure 2.** Average TSS load (lbs/day)

### Total Phosphorus

Total Phosphorus levels follow the same basic trend as TSS concentrations. The highest mean concentration, Sage Creek (0.25 mg/L) followed by Succor Creek downstream (0.21 mg/L) and Succor Creek upstream (0.18 mg/L). The majority of the high concentrations occurred between the months of May through July (Figure 3).

Average TP concentration at SC-1 was approximately 33% particulate with the remaining phosphorus (67%) comprised of ortho- phosphorus (OP). The ratio of TP to OP at SC-2 was approximately 50:50 (48 % dissolved to 52% total). SG total phosphorus average concentration was comprised almost entirely of particulate phosphorus



**Figure 3.** Total-p and ortho-p average concentrations (mg/L)

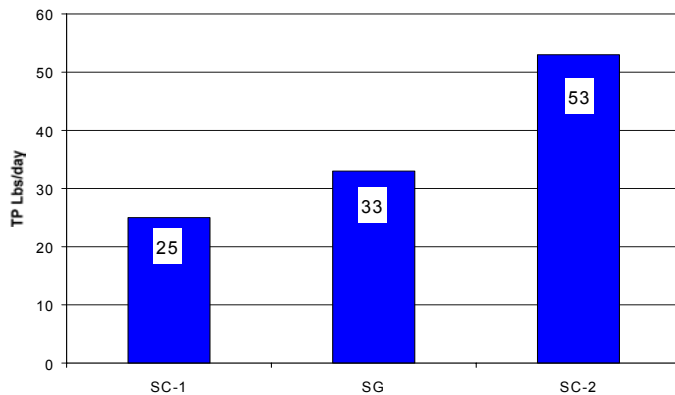


Figure 4. Total phosphorus load (lbs/day)

tied to sediment load (68 % TP, 32% OP).

Average daily phosphorus load for Succor Creek upstream site (background) averaged 25 lbs/day while Sage Creek averaged 33 lbs./day and the downstream station average was 53 lbs/day (Figure 4).

### Bacteria *Escherichia Coli*

Idaho state water quality law (IDAPA §58.01.02.251.01) states that waters designated for primary contact or secondary contact shall not contain *Escherichia coli* (*E. coli*) in a single sample greater than 406 organisms per 100 ml or 576 organisms per 100 ml, respectively.

SC-1 had 11 of 17 samples (65%) exceed the primary contact criteria for *E.coli* while SC-2 had 12 of 19 sample (63%) exceedances. SG exceeded the primary contact criteria in 9 of 19 samples (47%). Secondary exceedances at SC-1 were 53%, SC-2 at 58%, and SG at 32%. Refer to Table 1 for a statistical breakdown of the *E.coli* data.

Table 1. *E.coli* results

Succor Creek <i>E-Coli</i> Statistics (Counts/100 ml) (4/04/2000 through 3/19/2001)			
Statistic	SC-1	SC-2	SG
N	17	19	19
Mean	1488	1023	401
Median	800	660	400
Maximum	8300	5300	900
Minimum	170	28	14
St Dev.	2105	1487	297

### Temperature

All three sites never exceeded the water quality standard for cold water biota of 22°C maximum and 19° C average. All of the measurements were instantaneous and usually collected late morning to early afternoon. The

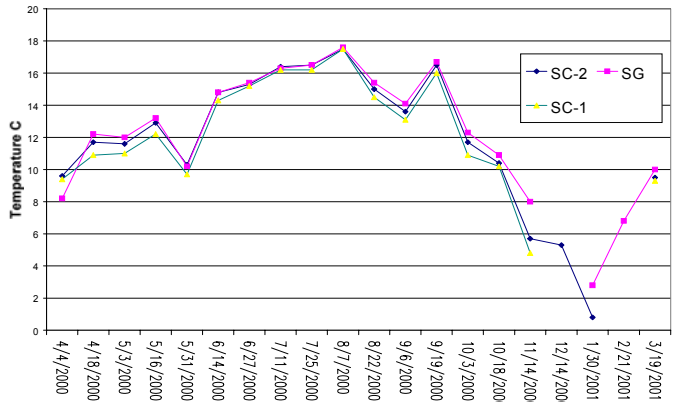


Figure 5. Instantaneous temperature measurements

highest recorded temperature was 17.6°C recorded on Sage Creek in August 2000. The highest recorded temperature on Succor Creek was 17.5°C recorded at both SC-1 and SC-2 on August 7, 2000 (Figure 5).

### Dissolved Oxygen

The State of Idaho standard for cold water biota states DO levels should exceed six mg/L at all times while warm water biota should exceed five mg/L at all times. There were no exceedances of water quality standards for either warm or cold water biota, at any station, during this program (Figure 6).

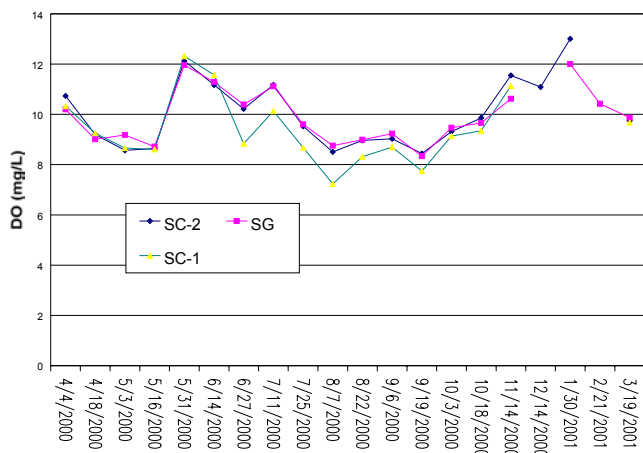


Figure 6. Instantaneous DO levels.

### pH

Water quality standards for pH require concentrations must fall within the range of 6.5 and 9.5. No exceedance for pH was observed at any site during the sampling period (Appendix A).

## Conclusions

- Sage Creek is a significant contributor of TSS and TP loading into Succor Creek.
- Treatment of Sage Creek would cause significant reductions in TSS and TP load to Succor Creek.
- If possible, diversion of all or part of Sage Creek into the wetland treatment area should be considered for reductions in TSS and TP.
- Phosphorus concentrations are above the recommended level of 0.075 mg/L cited for the Snake River Hells Canyon proposed TMDL.
- Bacteria levels (*E-coli*), at times, exceed the state water quality standard and should be addressed.
- Instantaneous measurements for pH, temperature and dissolved oxygen were all within state water quality standards.

## APPENDIX A

# ISDA Water Quality Results Succor Creek Monitoring Project 2000-2001

## Succor Creek Upstream

Date	D.O.	Temp	%Sat	Conduct	TDS	pH	Discharge	Nitrate/nitrite	Total-P	Ortho-P	TSS	TVSS	Fecal	E-Coli
4/4/2000	10.33	9.4	90.4	930	464	8.17	27.7	0.11	0.16	0.07	20	3	650	520
4/18/2000	9.25	10.9	83.8	671	336	7.81	18.2	0.41	0.14	0.08	25	4	1500	1300
5/3/2000	8.66	11	78.4	739	369	7.65	73.6	0.44	<b>1.82</b>	0.11	<b>1680</b>	107	>5000	>5000
5/16/2000	8.61	12.2	80.3	690	351	7.68	11.3	0.73	0.2	0.05	18	4	1100	1100
5/31/2000	12.32	9.7	108.5	836	423	7.44	21.5	0.67	0.19	0.13	30	3	1300	900
6/14/2000	11.57	14.3	113	792	398	7.79	31.3	0.73	0.18	0.15	23	5	800	800
6/27/2000	8.84	15.2	88.1	1029	519	7.72	16.7	0.88	0.13	0.11	12	2	370	370
7/11/2000	10.13	16.2	103	1078	546	7.63	14.8	0.8	0.19	0.13	11	2	1500	370
7/25/2000	8.68	16.2	88.2	867	439	7.72	16.8	0.71	0.35	0.14	46	7	1400	1400
8/7/2000	7.23	17.5	75.6	805	402	7.69	9.79	0.92	0.2	0.16	13	<2	4000	470
8/22/2000	8.32	14.5	81.6	1016	504	7.66	15.4	1.18	0.1	0.09	23	5	1200	1200
9/6/2000	8.7	13.1	82.9	1099	543	7.73	35.9	1.2	0.17	0.11	31	4	2200	300
9/19/2000	7.75	16	78.4	1411	709	7.91	16.7	1.6	0.15	0.14	8	3	>8300	>8300
10/3/2000	9.14	10.9	82.6	1352	678	8.1	27.7	1.67	0.09	0.09	15	4	900	330
10/18/2000	9.35	10.2	83.2	2010	990	8.16	19.7	3.13	0.19	0.16	18	2	470	370
11/14/2000	11.13	4.8	86.6	2060	1040	8.27	14.9	3.13	0.15	0.14	4	2	230	170
12/14/2000	Severly backed	up due to	large beaver	dam										
1/30/2001	Severly backed	up due to	large beaver	dam										
2/21/2001	no sample	flood stage												
3/19/2001	9.68	9.3	84.6	631	324	8.28	59.6	0.49	0.33	0.1	101	10	>2400	>2400

**ISDA Water Quality Results Succor Creek Monitoring Project 2000-2001**  
**Succor Creek Downstream**

Date	D.O.	Temp	%Sat	Conduct	TDS	pH	Discharge	Nitrate/nitrite	Total-P	Ortho-P	TSS	TVSS	Fecal	E-Coli
4/4/2000	10.74	9.6	94.5	1078	543	8.32	28.9	1.05	0.15	0.07	15	4	420	300
4/18/2000	9.2	11.7	84.6	699	350	7.96	47.2	0.78	0.23	0.07	94	9	820	660
5/3/2000	8.57	11.6	78.9	796	399	7.78	92.5	0.61	<b>0.72</b>	0.08	<b>545</b>	39	>5000	>5000
5/16/2000	8.64	12.9	81.8	641	322	8.27	37.1	0.99	0.13	0.06	74	8	1100	800
5/31/2000	12.13	10.3	108.4	713	359	8.22	66.7	0.78	0.27	0.09	160	14	840	660
6/14/2000	11.17	14.8	110.02	760	382	8.02	73.4	0.95	0.22	0.11	72	7	3100	470
6/27/2000	10.22	15.3	102	857	431	7.83	56.4	1.19	0.28	0.09	115	9	970	970
7/11/2000	11.17	16.4	114.2	845	427	7.77	49.1	1.18	0.28	0.1	116	10	630	300
7/25/2000	9.53	16.5	97.8	848	429	7.68	39	1.39	0.26	0.11	91	11	2800	800
8/7/2000	8.51	17.5	89.1	871	437	8.08	47.8	1.48	0.24	0.1	90	8	5300	5300
8/22/2000	8.97	15	89.1	944	467	8.1	49.7	1.57	0.14	0.07	65	7	3800	830
9/6/2000	9.03	13.6	87	991	488	8.06	72.7	1.57	0.16	0.09	42	4	1900	400
9/19/2000	8.44	16.5	86.6	1128	598	8.04	39.1	1.94	0.12	0.1	25	5	4700	140
10/3/2000	9.32	11.7	86.1	1013	499	8.13	72.1	1.59	0.12	0.1	42	6	2700	770
10/18/2000	9.86	10.4	89.1	2050	1000	8.17	25.6	4.27	0.25	0.16	88	9	300	170
11/14/2000	11.55	5.7	92.3	2150	1050	8.36	24.9	4.55	0.18	0.12	12	2	170	100
12/14/2000	11.09	5.3	87.5	1981	970	8.32	17.2	4.03	0.17	0.13	<2	<2	1100	630
1/30/2001	13.01	0.8	91.4	1942	970	8.24	12.3	4.74	0.19	0.1	15	4	1100	28
2/21/2001	No sample	flood stage												
3/19/2001	9.75	9.5	85.3	664	341	8.26	59.4	0.84	0.33	0.09	103	12	1100	1100

# ISDA Water Quality Results Succor Creek Monitoring Project 2000-2001

## Sage Creek

Date	D.O.	Temp	%Sat	Conduct	TDS	pH	Discharge	Nitrate/nitrite	Total-P	Ortho-P	TSS	TVSS	Fecal	E-Coli
4/4/2000	10.2	8.2	86.5	2680	1340	8.13	3.34	0.66	0.09	0.08	3	2	270	100
4/18/2000	9.01	12.2	84	723	361	7.96	30.7	1.03	0.25	0.05	188	14	188	14
5/3/2000	9.18	12	84.8	768	383	7.76	23.6	1	0.12	0.05	73	7	300	220
5/16/2000	8.72	13.2	83	626	311	8.23	33.7	1	0.31	0.025	107	10	680	680
5/31/2000	11.96	10.2	106.6	549	278	7.97	40.7	0.94	0.29	0.07	142	8	3500	580
6/14/2000	11.29	14.8	112.1	682	351	7.82	32.2	1.29	0.25	0.07	118	11	730	470
6/27/2000	10.39	15.4	103.7	725	370	7.83	32.9	1.44	0.48	0.08	234	21	1300	830
7/11/2000	11.12	16.3	113.7	730	399	7.77	37.9	1.31	0.35	0.08	146	13	570	470
7/25/2000	9.6	16.5	98.5	830	423	7.79	24.6	1.82	0.45	0.1	130	14	900	900
8/7/2000	8.76	17.6	91.7	858	434	7.93	32	1.7	0.19	0.11	84	10	2900	770
8/22/2000	8.99	15.4	89.9	856	426	8.01	37.5	1.88	0.12	0.07	65	8	1200	830
9/6/2000	9.23	14.1	89.8	857	423	7.92	35.3	1.92	0.11	0.06	33	6	2200	500
9/19/2000	8.34	16.7	85.7	949	478	7.95	25.4	2.2	0.18	0.06	15	4	400	270
10/3/2000	9.47	12.3	88.7	753	368	8.18	45.9	1.59	0.14	0.09	57	6	500	400
10/18/2000	9.66	10.9	87.8	2050	1010	8.13	8.1	7.16	0.75	0.13	786	97	200	130
11/14/2000	10.62	8	89.8	2190	1100	8.35	12.1	7.93	0.14	0.11	26	4	200	200
12/14/2000	Submerged	flow due	to Succor	creek being	backwatered	by beaver	dam							
1/30/2000	12	2.8	88.7	2190	1100	8.32	1.8	8.99	0.13	0.07	8	<2	93	93
2/21/2001	10.42	6.8	85.3	2030	1040	8.23	3.51	6.75	0.14	0.09	15	6	93	93
3/19/2001	9.87	10	87.6	2040	1030	8.31	3.02	6.58	0.21	0.09	22	2	75	75